

NON-PUBLIC?: N
ACCESSION #: 9301110173
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Unit 1 PAGE: 1 OF 06

DOCKET NUMBER: 05000528

TITLE: Reactor Trip caused by Main Turbine Trip
EVENT DATE: 12/08/92 LER #: 92-016-00 REPORT DATE: 01/02/93

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Thomas R. Bradish, Manager, Nuclear TELEPHONE: (602) 393-5421
Regulatory Affairs

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: EL COMPONENT: 51 MANUFACTURER: G080
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At approximately 1430 MST on December 8, 1992, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) operating at approximately 100 percent power when a Unit 1 main turbine trip occurred followed by a reactor trip on high pressurizer pressure. At approximately 1450 MST, on December 8, 1992, the plant was stabilized in Mode 3 (HOT STANDBY). The Shift Supervisor (utility, licensed) classified the event as an uncomplicated reactor trip in accordance with Emergency Plan Implementing Procedures. No other safety system responses occurred and none were required.

APS Plant Engineering has determined that the apparent cause of the reactor trip was a turbine trip caused by the actuation of the Static Negative Sequence Time Over Current Relay following a grid perturbation when the relay incorrectly continued to count down after the disturbance cleared. The Static Negative Sequence Time Over Current Relay has been replaced in each Unit's Main Generator output control circuit with an

updated model not susceptible to the timing problems identified in this investigation.

There have been no previous similar events reported pursuant to 10CFR50.73.

END OF ABSTRACT

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I. DESCRIPTION OF WHAT OCCURRED:

A. Initial Conditions:

At 1430 MST on December 8, 1992, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) at approximately 100 percent power.

B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: An event that resulted in an automatic actuation of the Reactor Protection System (RPS)(JC).

At approximately 1430 MST on December 8, 1992, a Unit 1 main turbine (TA) trip occurred followed by a reactor (RCT)(AC) trip on high pressurizer (AB) pressure from RPS channels "A" and "C". The Control Element Assemblies (CEA)(AA) were not selected for reactor power cutback (RPCB) (JD) large load reject event due to a deficiency that had been identified with Control Element Assembly Calculator (CEAC)(AA) software for RPCB during a previous Unit 3 event (LER 530/91-008-00). The apparent cause of the turbine trip was determined to be the actuation of a generator lockout relay (EL)(RLY)(86) caused by a malfunction of the Static Negative Sequence Time Over Current Relay (EL)(RLY)(51). At the time of the event, a 230 kilovolt distribution line in East Phoenix developed a fault on its "C" phase and relayed off line. This fault resulted in a large enough negative sequence current to start timing the Static Negative Sequence Time Over Current Relay. However, the fault cleared in 4.5 cycles (75 milliseconds) and should not have caused the Static Negative Sequence Time Over Current Relay to trip. Normally a fault signal of the magnitude induced would need to be present 10 minutes to actuate the Static Negative Sequence Over Current Relay. Units 2 and 3 were at 100 percent

power and remained so throughout the event.

At approximately 1450 MST, on December 8, 1992, the plant was stabilized in Mode 3 (HOT STANDBY). The Shift Supervisor (utility, licensed) classified the event as an uncomplicated reactor trip in accordance with Emergency Plan Implementing Procedures. No other safety system responses occurred and none were required.

C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Not applicable - no structures, systems, or components were inoperable at the start of the event which contributed to this

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event.

D. Cause of each component or system failure, if known:

The apparent cause of the failure of the Static Negative Sequence Time Over Current Relay is an inherent design characteristic to occasionally count down instead of up when receiving a trip signal. Phone conversations with the vendor (General Electric) following this event revealed that this characteristic was identified by the vendor in a service bulletin in 1987 (see Section V). An Equipment Root Cause of Failure Analysis is being conducted as identified in Sections I.I and III.B. If the analysis results differ significantly from the apparent cause, a supplement to this report will be submitted to describe the final root cause of failure.

E. Failure mode, mechanism, and effect of each failed component, if known:

The Static Negative Sequence Time Over Current Relay operated early due to an inherent design characteristic. This resulted in the actuation of a generator lockout relay which tripped the Main Generator Output Breakers (EL)(BKR) and initiated a turbine trip.

F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - no failures of components with multiple functions were involved.

G. For a failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

Not applicable - no failures that rendered a train of a safety system inoperable were involved.

H. Method of discovery of each component or system failure or procedural error:

Unit 1 operations personnel (utility, licensed) initially found the trip flag for the Static Negative Sequence Time Over Current Relay in the tripped position after the event indicating that the relay had actuated. APS Plant Engineering contacted the vendor (General Electric) and was informed that this relay (model 12SGC21B1A, Revision A) on rare occasions will incorrectly count down instead of up when receiving a fault signal.

No procedural errors were identified.

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I. Cause of Event:

An investigation of this event was conducted in accordance with the APS Incident Investigation Program. Operations personnel initially found the trip flag for the Static Negative Sequence Time Over Current Relay in the tripped position after the event indicating that the relay had actuated. The Static Negative Sequence Time Over Current Relay acts to prevent the Main Generator (TB)(GEN) from over-heating due to unbalanced loading by actuating one of several generator lockout relays which in turn opens the Main Generator output breakers and initiates a turbine trip.

APS Plant Engineering developed an action plan to determine the cause of the actuation of the Generator Lockout Relay. This consisted of verifying wire connections, testing of current transformers that feed the Generator Lockout Relay, and testing the Generator Lockout Relay. No problems were identified during this process. The Static Negative Sequence Time Over Current Relay was then tested with various current inputs and

operated per design each time. Duplication of the event was not achieved and the Static Negative Sequence Time Over Current Relay which actuated in Unit 1 was replaced with the same model.

APS Plant Engineering contacted the vendor (General Electric) and was informed that on rare occasions the timing circuit for this relay (model 12SGC21B1A,, Revision A) will count down instead of up when the trip threshold on the relay is reached. When this occurs, a trip of the relay will occur within 200 milliseconds. This was found to be consistent with the digital fault recorder traces of the event. During this investigation, APS Plant Engineering also identified that a newer more reliable relay was available. This newer model (12SGC21B1A, Revision C) has been installed in all three Main Generator output control circuits.

As part of the investigation, APS Plant Engineering has initially determined that the apparent cause of the reactor trip was the tripping of the main turbine initiated by the actuation of the Static Negative Sequence Time Over Current Relay following a grid perturbation (SALP Cause Code B: Design).

An Equipment Root Cause of Failure Analysis is being performed to determine the cause of the actuation of the Static Negative Sequence Time Over Current Relay. If the analysis results differ significantly from the apparent cause, a supplement to this report will be submitted to describe the final root cause of failure.

No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to this event. There were no

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identified procedural or personnel errors which contributed to this event.

J. Safety System Response:

Other than the RPS trip on high pressurizer pressure discussed in section I.B, no other safety system responses occurred and none were necessary.

K. Failed Component Information:

General Electric relay model 12SGC21B1A, Revision A

II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

Nuclear Fuel Management (NFM) performed an assessment of the event and determined that the equipment and systems assumed in the Updated Final Safety Analysis Report (UFSAR) Chapter 15 were functional and performed as required. No abnormal transients were identified following the reactor trip. Scenarios defined in UFSAR Chapter 6 concerning the Loss of Coolant Accident (LOCA) were not challenged during this event.

A turbine trip is characterized as a decrease in heat removal event and is normally evaluated for peak pressures. The limiting event in this category is a Loss of Condenser Vacuum (LOCV) event. The Reactor Coolant System (RCS) peak pressure of 2384 pounds per square inch absolute (psia) observed during this event was less than the 2742 psia RCS peak pressure for the LOCV event discussed in Chapter 15.2 of the UFSAR. The assessment concluded that this event did not result in a transient more severe than those already analyzed. The event did not cause any violation of Specified Acceptable Fuel Design Limits (SAFDL). No safety system actuation occurred and none were required. The event did not result in any challenges to the fission product barriers or result in any releases of radioactive materials. Therefore, there were no adverse safety consequences or implications as a result of this event. This trip did not adversely affect the safe operation of the plant or the health and safety of the public.

III. CORRECTIVE ACTION:

A. Immediate:

The faulty relay in Unit 1 was replaced with an identical General Electric relay, model 12SGC21B1A, Revision A.

B. Action to Prevent Recurrence:

After contact with the vendor, a newer more reliable model

(12SGC21B1A, Revision C) of the Static Negative Sequence Time Over Current Relay has been installed in all three Main Generator output control circuits. An Equipment Root Cause of Failure Analysis is being performed to determine the cause of the actuation of the Static Negative Sequence Time Over Current Relay. This analysis is expected to be completed by January 29, 1993. If the analysis results differ significantly from the apparent cause, a supplement to this report will be submitted to describe the final root cause of failure.

IV. PREVIOUS SIMILAR EVENTS:

There are no previous similar events reported pursuant to 10CFR50.73

V. ADDITIONAL INFORMATION:

The service bulletin identified in Section I.D. was issued in 1987 and related to the improper operation of the Static Negative Sequence Time Over Current Relay. An investigation is being conducted in accordance with the APS Incident Investigation Program to determine why the information in the bulletin was not utilized and determine what corrective actions are warranted. The corrective actions will be controlled in accordance with the APS Incident Investigation Program.

Based on reviews by the Plant Review Board, the Management Response Team and the Plant Manager, a Unit restart was authorized in accordance with approved procedures. Unit 1 entered Mode 2 (STARTUP) at approximately 2155 MST on December 9, 1992 and Mode 1 (POWER OPERATION) at approximately 0238 MST on December 10, 1992. Unit 1 synchronized to the grid at approximately 1524 MST on December 11, 1992.

ATTACHMENT 1 TO 9301110173 PAGE 1 OF 1

Arizona Public Service Company
PALO VERDE NUCLEAR GENERATING STATION
P.O. BOX 52034 o PHOENIX, ARIZONA 85072-2034

JAMES M. LEVINE 192-00820-JML/TRB/RJR
VICE PRESIDENT January 2, 1993
NUCLEAR PRODUCTION

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Mail Station P1-37

Washington, D.C. 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)

Unit 1

Docket No. STN 50-528 (License No. NPF-41)

Licensee Event Report 92-016-00

File: 93-020-404

Attached please find Licensee Event Report (LER) 92-016-00 prepared and submitted pursuant to 10CFR50.73. This LER reports a reactor trip caused by a turbine trip from actuation of the "Static Negative Sequence Time Over Current Relay" following a grid perturbation. In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region V.

If you have any questions, please contact Thomas R. Bradish, Manager, Nuclear Regulatory Affairs, at (602) 393-5421.

Very truly yours,

JML/TRB/RJR/mh

Attachment

cc: W. F. Conway (all with attachment)

J. B. Martin

J. A. Sloan

INPO Records Center

*** END OF DOCUMENT ***
